23PPH21 — STATISTICAL MECHANICS

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1.   Define Thermodynamic potentials.

2.   What are the basic characteristic of all the four thermodynamics function.

3.   Define phase space.

4.   State conditions of equilibrium of sub systems.

5.   Define density of states.

6.   What do you mean by fluctuations? How it is measured?

7.   What is the difference between classical and quantum statics.

8.   State density matrix.

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9. What do you mean by Ising model?

10. Define dissipation theorem.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Write a short note on Gibb's phase rule.

Or

(b) Explain critical indices.
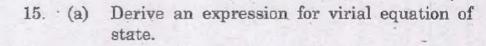
12. (a) Write short notes on micro canonical ensemble.

Or

(b) What is Gibb's paradox? How it has been resolved?

13. (a) State and prove Liouville's theorem. Discuss its Physical Significance.

Or

(b) Obtain the expression for partition function.

14. (a) Derive an expression for Maxell-Boltzmann statistics.

Or

(b) Explain Bose-Einstein statistics.

15. (a) Derive an expression for virial equation of state.

Or

(b) Write a short note on Brownian motion.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain in details. Landau's theory of phase transition.

17. Deduce the entropy of an ideal gas using the micro canonical ensemble.

18. Explain canonical and grand canonical ensembles with neat diagram.

19. Derive the expression for Bose Einstein condensation for ideal gas.

20. Deduce the mean field theories of the Ising model in three, two and one dimensions.